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ABSTRACT

The cost/productivity of academic program clusters at Linccln University, Missouri, was studied in fall 1979. The study was designed to: provide useful information to the academic decision makers: provide information by which Lincoln University costs can be compared with external standards: and to make management information more accessible and meaningful to deans, department heads, and faculty members, since the college has a very limited data base. Five cost indicator ratios were determined and rank-ordered profiles were prepared for each discipline cluster. Cost indicator ratios were: faculty salary per student credit hour: instructional cost per student credit hour: total cost per student: student credit hours per full-time equivalent: and student/faculty ratio. It is claimed that computation of a mean z-score permitted each discipline cluster to see its relative placement with respect to all other disciplines. (Author/SW)

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A COST/PRODUCTIVITY PROFILE OF ACADEMIC PROGRAM COSTS AT A SMALL TRADITIONALLY BLACK STATE LAND GRANT UNIVERSITY

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This paper was presented at the Twentieth Annual Forum of the Association for Institutional Research held at the Peachtree Plaza Hotel in Atlanta, Georgia, April 27 - May 1, 1980. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

A COST/PRODUCTIVITY PROFILE OF ACADEMIC PROGRAM COSTS AT A SMALL TRADITIONALLY BLACK STATE LAND GRANT UNIVERSITY

ABSTRACT: *This paper reports a study at a small public university on the cost/productivity of academic program clusters in fall, 1979. Five cost indicator ratios were determined and rank-ordered profiles were prepared for each discipline cluster. Computation of a mean z-score, $\bar{z}$, permitted each discipline cluster to see its relative placement with respect to all other disciplines.*

The study was designed to provide graphic cost/productivity data to academic decision-makers under conditions of a very limited data base. It was not intended to be a definitive cost analysis, but to aid in promoting discussion, identifying gaps and weaknesses in the data base, and to assist with academic planning and decision-making.

INTRODUCTION

The need for priority-setting at the campus level has always existed, even during the golden 1960's when there was a seemingly unlimited supply of students and dollars gravitating to colleges and universities. Rarely was the need recognized, however, and only with the realities of "steady-state" financing, during an era of double-digit inflation, have institutions begun to address seriously the questions of priorities.

As we enter the decade of the 1980's, which has been characterized as the decade of the "new 'Three R's'-- Retrenchment, Reduction, and Reallocation" -- it is becoming increasingly evident that additional resources for growing programs must come from internal reallocations. Current trends such as the passage of Proposition 13 make this type of planning an immediate priority. Many states are adopting rigorous standards of "quality" and "need". Programmatic decisions seemingly are being made increasingly on a statewide basis, but there is some disagreement that this should be the case (3,6,7,8,9).

The assessment of cost/effectiveness relationships is a complex judgemental process that is fraught with pitfalls. Major considerations must be the size of the "gap" between current level of quality and that which is desired, and the

relationships between cost, productivity, and overall benefit to the University.

The Purposes of this study were:

a. to provide useful information to the academic decision makers regarding the costs and the productivity of the academic departments.

b. to provide information by which Lincoln University costs can be compared with external standards; and

c. to make management information more assessible and meaningful to deans, department heads, and faculty members.

REVIEW OF THE LITERATURE

In 1972 the Carnegie Commission on Higher Education published a major report suggesting that the total institutional expenditures of higher education must and can be reduced by twenty percent by 1980.(8) Today, several years after it was issued, none of its recommendations has been universally or even widely adopted. Yet each of its recommendations is still being discussed and in many cases experimentation relevant to its recommendation is continuing. Despite the passage of time, the Commission's recommendations retain their relevance and their potential impact.

A comprehensive document relating to methodology of cost/outcome relationships in higher education was produced by American Council on Education.(1) This report identifies and organizes the literature of cost and cost analysis of higher education, and provides useful schemes for distinguishing among various cost concepts and types of cost analysis.

There is now a sizable body of literature regarding various formulas by which cost/productivity may be measured (1,2,4,5,6,8,9). Upon close examination, however, virtually all of these funding formulas require a sophisticated management information system which is simply not available on campuses without data processing support.

There appears to be a movement on a national level to adopt a statewide

funding formula (2,3,6,7). Missouri is no exception; an enrollment-driven funding formula has been in use since 1976.

This study shows that despite serious deficiencies in information management and data processing support, it is possible to produce meaningful information.

DESIGN AND METHODOLOGY

All the academic degree programs offered by Lincoln University were categorized into one of twenty-six "academic discipline clusters", as shown in Table I.

Table I

Academic Discipline Clusters

1. Agriculture	14. Journalism
2. Art	15. Mathematics
3. Biology	16. Modern Foreign Languages
4. Business Administration	17. Music
5. Chemistry	18. Nursing Science
6. Computer Science	19. Philosophy
7. Criminal Justice	20. Physics
8. Economics	21. Political Science
9. Education	22. Psychology
10. English	23. Sociology/Anthropology
11. Health and Physical Education	24. Special Education
12. Home Economics	25. Speech and Theatre
13. History	26. Technologies

Input Factors

Five cost analysis input factors were selected:

1. Faculty FTE;
2. Faculty Salary;
3. Total Cost of Instruction;
4. Number of Student Credit Hours; and
5. Number of Students

"Faculty FTE" was determined from fall, 1979 faculty workload sheets and included each full and part time faculty member's time proportionated to the discipline cluster in which they taught. Faculty FTE included committee work and departmental administration but excluded extramurally funded research, intercollegiate athletics, and release time for administration of funded projects. The work effort of the departmental head and college dean was also distributed proportionately.

The input factor "Faculty Salary" was the composite of one-half of the 10-month base annual salary for the FTE faculty assigned to this cluster.

"Total Cost of Instruction" included faculty salary plus fringe benefits, clerical and paraprofessional support, and one-half of the other-than-personal-services budget for the academic year. Indirect costs related to utilities, communications, library purchases, and one-time purchases of non-consumables were excluded.

"Number of Student Credit Hours" was determined from fall, 1979 HEGIS census date enrollment reports. The "Number of Students" was a duplicate count of total enrollment in classes for fall, 1979, from the census date enrollment printout. *All the input data were reviewed with each academic dean and department head at this point.*

Cost Indicator Ratios

Five cost indicator ratios were derived:

1. Faculty Salary per Student Credit Hour;
2. Instructional Cost per Student Credit Hour;
3. Total Cost per Student;
4. Student Credit Hours per FTE; and
5. Student/Faculty Ratio

These were rank-ordered, from lowest cost to highest cost, and a "profile" drawn for each of the academic discipline clusters. Sample program profiles of a relatively low cost program, one of average cost, and a relatively high cost program are shown on pages 6-8. In this manner each faculty member was able to see the placement of his/her discipline with relation to other academic program clusters.

Conversion to $\bar{z}$-Scores

Each of the cost/productivity indicator ratios was transformed to a z-score, and a mean z-score, $\bar{z}$, computed for each academic cluster, as shown in Table II (Page 9). The $\bar{z}$-scores were rank-ordered and presented to the administration in order that determination could be made concerning what constituted "superior", "good", "acceptable", and/or "poor" cost/productivity.

Individual reports were prepared for each academic department regarding their profile(s). Other background information to help them interpret the data and understand the implications of their profiles was provided.

SUMMARY AND CONCLUSIONS

This study was undertaken to provide graphic cost/productivity data to academic decision-makers under conditions of a very limited data base. It has been positively received.

SAMPLE PROGRAM "A"

LOW COST PROGRAM

COST ANALYSIS PROFILE

ACADEMIC PROGRAMS (Alphabetized)	FACULTY SALARY PER STUDENT CREDIT HOUR	INSTRUCTIONAL COST PER STUDENT CREDIT HOUR	TOTAL COST PER STUDENT	STUDENT CREDIT HOURS PER FTE	STUDENT/ FACULTY RATIO
1.	19.55	22.94	61.61	372.24:1	172.76
2.	20.76	23.46	65.23	309.39:1	130.92
3.	24.26	30.08	68.88	291.15:1	106.27
4.	26.65	33.45	92.99	280.70:1	99.05
5.	29.02	36.42	93.97	276.00:1	95.61
6.	29.88	36.67	101.70	274.29:1	94.35
7.	30.30	36.86	109.25	259.53:1	91.43
8.	30.65	37.11	110.01	257.09:1	90.19
9.	31.93	37.75	110.43	253.18:1	86.51
10.	32.32	37.79	113.35	232.45:1	85.70
11.	32.65	39.99	119.98	231.74:1	85.19
12.	33.83	42.04	120.14	230.69:1	83.44
13.	38.08	46.75	131.84	205.56:1	83.36
14.	40.23	51.54	133.62	203.12:1	71.32
15.	48.14	57.41	134.40	180.87:1	68.52
16.	48.32	59.52	144.80	176.25:1	65.58
17.	50.83	61.28	170.34	173.33:1	60.29
18.	53.38	63.63	172.23	164.52:1	57.05
19.	53.47	64.06	177.79	150.06:1	51.04
20.	56.14	65.67	188.33	134.55:1	47.01
21.	65.73	81.02	224.10	124.92:1	43.85
22.	68.58	81.19	233.15	115.08:1	38.81
23.	69.57	85.40	271.77	111.68:1	37.10
24.	112.86	142.52	314.19	67.98:1	30.48
25.	119.30	143.05	341.79	66.60:1	27.87
26.	162.25	198.40	712.60	48.27:1	13.60

SOURCE: Office of Planning and Analysis

SAMPLE PROGRAM "B"

AVERAGE COST

COST ANALYSIS PROFILE

ACADEMIC PROGRAMS (Alphabetized)	FACULTY SALARY PER STUDENT CREDIT HOUR	INSTRUCTIONAL COST PER STUDENT CREDIT HOUR	TOTAL COST PER STUDENT	STUDENT CREDIT HOURS PER FTE	STUDENT/ FACULTY RATIO
1.	19.55	22.94	61.61	372.24:1	172.76
2.	20.76	23.46	65.23	309.39:1	130.92
3.	24.26	30.08	68.88	291.15:1	106.27
4.	26.65	33.45	92.99	280.70:1	99.05
5.	29.02	36.42	93.97	276.00:1	95.61
6.	29.88	36.67	101.70	274.29:1	94.35
7.	30.30	36.86	109.25	259.53:1	91.43
8.	30.65	37.11	110.01	257.09:1	90.19
9.	31.93	37.75	113.35	253.18:1	86.51
10.	32.32	37.79	113.35	232.45:1	85.70
11.	32.65	39.99	119.98	231.74:1	85.19
12.	33.83	42.04	120.14	230.69:1	83.44
13.	38.08	46.75	131.84	205.56:1	83.36
14.	40.23	51.54	133.62	203.12:1	71.32
15.	48.14	57.41	134.40	180.87:1	68.52
16.	48.32	59.52	144.80	176.25:1	65.58
17.	50.83	61.28	170.34	173.33:1	60.29
18.	53.38	63.63	172.23	164.52:1	57.05
19.	53.47	64.06	177.79	150.06:1	51.04
20.	56.14	65.67	188.33	134.55:1	47.01
21.	65.73	81.02	224.10	124.92:1	43.85
22.	68.58	81.19	233.15	115.08:1	38.81
23.	69.57	85.40	271.77	111.68:1	37.10
24.	112.86	142.52	314.19	67.98:1	30.48
25.	119.30	143.05	341.79	66.60:1	27.87
26.	162.25	198.40	712.60	48.27:1	13.60

SOURCE: Office of Planning and Analysis

SAMPLE PROGRAM "C"

RELATIVELY HIGH COST PROGRAM

COST ANALYSIS PROFILE

Fall, 1979

ACADEMIC PROGRAMS (Alphabetized)	FACULTY SALARY PER STUDENT CREDIT HOUR	INSTRUCTIONAL COST PER STUDENT CREDIT HOUR	TOTAL COST PER STUDENT	STUDENT CREDIT HOURS PER FTE	STUDENT/FACULTY RATIO
1.	19.55	22.94	61.61	372.24:1	172.76
2.	20.76	23.46	65.23	309.39:1	130.92
3.	24.26	30.08	68.88	291.15:1	106.27
4.	26.65	33.45	92.99	280.70:1	99.05
5.	29.02	36.42	93.97	276.00:1	95.61
6.	29.88	36.67	101.70	274.29:1	94.35
7.	30.30	36.86	109.25	259.53:1	91.43
8.	30.65	37.11	110.01	257.09:1	90.19
9.	31.93	37.75	110.43	253.18:1	86.51
10.	32.32	37.79	113.35	232.45:1	85.70
11.	32.65	39.99	119.98	231.74:1	85.19
12.	33.83	42.04	120.14	230.69:1	83.44
13.	38.08	46.75	131.84	205.56:1	83.36
14.	40.23	51.54	133.62	203.12:1	71.32
15.	48.14	57.41	134.40	180.87:1	68.52
16.	48.32	59.52	144.80	176.25:1	65.58
17.	50.83	61.28	170.34	173.33:1	60.29
18.	53.38	63.63	172.23	164.52:1	57.05
19.	53.47	64.06	177.79	150.06:1	51.04
20.	56.14	65.67	188.33	134.55:1	47.01
21.	65.73	81.02	224.10	124.92:1	43.85
22.	68.58	81.19	233.15	115.08:1	38.81
23.	69.57	85.40	271.77	111.68:1	37.10
24.	112.86	142.52	314.19	67.98:1	30.48
25.	119.30	143.05	341.79	66.60:1	27.87
26.	162.25	198.40	712.60	48.27:1	13.60

SOURCE: Office of Planning and Analysis

TABLE II

COST/PRODUCTIVITY INDICATORS
(Z-SCORES)

Academic Program Review
Fall, 1979

READ ACROSS	Z_1	Z_2	Z_3	Z_4	Z_5	$\bar{Z}$
ACADEMIC PROGRAMS (Alphabetized)	FACULTY SALARY PER STUDENT CREDIT HOUR	INSTRUCTIONAL COST PER STUDENT CREDIT HOUR	TOTAL COST PER STUDENT*	STUDENT CREDIT HOURS PER FTE	STUDENT/FACULTY RATIO	MEAN Z-SCORE (Z - S C O R E)
1. Agriculture	- 0.067	- 0.036	+ 0.299	- 0.285	+ 0.281	+ 0.038
2. Art	- 0.434	- 0.456	- 0.450	- 1.070	- 1.013	- 0.685
3. Biology	+ 0.386	+ 0.257	+ 0.318	+ 0.377	+ 0.477	+ 0.363
4. Business Administration	+ 0.936	+ 0.948	+ 0.823	+ 2.099	+ 1.658	+ 1.293
5. Chemistry	- 0.149	- 0.085	+ 0.304	- 0.320	+ 0.332	+ 0.016
6. Computer Science	+ 0.900	+ 0.936	+ 0.795	+ 0.986	+ 0.634	+ 0.850
7. Criminal Justice	+ 0.513	+ 0.536	+ 0.408	+ 0.072	- 0.151	+ 0.276
8. Economics	+ 0.617	+ 0.622	+ 0.489	+ 0.908	+ 0.513	+ 0.630
9. Education	+ 0.008	- 0.046	- 0.110	- 0.603	- 0.658	- 0.282
10. English	+ 0.726	+ 0.606	+ 0.546	+ 1.113	+ 0.943	+ 0.787
11. Health and Physical Education	+ 0.548	+ 0.486	+ 0.850	+ 0.651	+ 2.871	+ 1.081
12. Home Economics	- 2.024	- 1.956	- 1.274	- 1.618	- 1.330	- 1.640
13. History	+ 0.607	+ 0.589	+ 0.458	+ 0.698	+ 0.347	+ 0.540
14. Journalism	- 0.519	- 0.460	- 0.030	- 0.909	- 0.484	- 0.480
15. Mathematics	+ 0.796	+ 0.775	+ 0.605	+ 1.335	+ 0.734	+ 0.849
16. Modern Foreign Language	- 0.070	+ 0.021	- 0.743	- 0.427	- 1.063	- 0.456
17. Music	- 3.298	- 3.294	- 1.064	- 1.841	- 1.254	- 2.150
18. Nursing Science	- 1.833	- 1.943	- 4.084	- 1.600	- 1.744	- 2.241
19. Philosophy	+ 0.569	+ 0.616	+ 0.483	+ 0.728	+ 0.370	+ 0.553
20. Physics	+ 0.630	+ 0.612	+ 0.407	+ 0.399	- 0.070	+ 0.396
21. Political Science	+ 0.083	+ 0.115	+ 0.012	- 0.229	- 0.390	- 0.082
22. Psychology	+ 0.557	+ 0.590	+ 0.480	+ 0.928	+ 0.598	+ 0.631
23. Sociology/Anthropology	+ 0.655	+ 0.694	+ 0.612	+ 0.390	+ 0.279	+ 0.522
24. Special Education	- 0.548	- 0.562	- 0.381	- 1.030	- 0.867	- 0.678
25. Speech and Theatre	+ 0.088	+ 0.064	+ 0.026	- 0.792	- 0.775	- 0.278
26. Technologies	+ 0.323	+ 0.372	+ 0.220	+ 0.042	- 0.237	+ 0.144

* *Duplicate count - whenever a student is enrolled in both a class and a laboratory he/she is counted twice.*

SOURCE: Office of Planning and Analysis

The second indicator ratio, "Instructional Cost per Student Credit Hour", is particularly useful because it incorporates the same data used by the State of Missouri in calculating program costs for credit hours in disciplines with similar characteristics (7). This indicator ratio thus allows a program-by-program comparison with costs recommended by the Missouri Department of Higher Education.

This project has now become a permanent part of the Planning and Analysis annual work assignment. A new profile each fall allows an immediate visual display of the results of decisions which impact on the costing of a program--enrollment decisions by students, decisions by administrators regarding faculty replacement, class size, etc.

Overall, the biggest advantage of this study has been an increase in the positive communications between the institutional research unit and the academic departments. This research activity has been instrumental in permitting us to accomplish our goal of implementing a University Long Range Plan last spring.

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